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THE TRIDIMENSIONAL THEORY OF FEELING FROM THE STANDPOINT OF TYPICAL EXPERIENCES [1]

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This study is a supplement to the experiments by the method of paired comparisons made by Titchener [2] in 1902 and by Hayes [3] in 1906. The results of these experiments are later summed up as follows: [4]

"(1) Judgments of pleasantness and unpleasantness are direct, easy, and natural. The qualities themselves appear to the observers to be simple and homogeneous, identical throughout the experiments. Their opposite character is vouched for both by introspection and by the course of the curves.

"(2) Judgments of excitement are less direct, and the term is equivocal. If it is taken as the opposite of depressing melancholy, its curve agrees with that of pleasantness; if it is taken as the opposite of tranquility or soothing calm, its curve agrees with that of unpleasantness: the reverse curves then agree with those of unpleasantness and of pleasantness, respectively. If, in default of special instruction, the observer vacillates between the two meanings of the word, the curve shows a vacillating character,—partly 'pleasant' and partly 'unpleasant;' the period and nature of the affective oscillation are vouched for by introspection. Judgments of depression are, in their turn, distinctly less direct than those of excitement, and are often associatively mediated. There is no evidence of a dimension of excitement-depression, still less of a number of exciting and depressing qualities.

[1] From the Psychological Laboratory of Cornell University.
[2] E. B. Titchener, *Philos. Stud.*, 20, 1902, 382-406.
[3] S. P. Hayes, *Am. Journ. Psych.*, 17, 1906, 358-393.
[4] E. B. Titchener, *Lectures on the Elementary Psychology of Feeling and Attention*, 1908, 165 ff.

"(3) Judgments of tension are easy; but tension is described, throughout, in kinaesthetic terms. Increasing tension means, uniformly, increasing unpleasantness, and the curves of the two classes of judgment correspond. Relaxation may be taken as the opposite of unpleasant tension, in which case its curve agrees with the curve of pleasantness, or may be identified with depression. Nowhere is there evidence, in this third case, either of a new affective dimension or of specific qualities.

"Naturally, these results are not 'conclusive.' For one thing, the experiments are too few. For another, they were obtained in a single laboratory, and that a laboratory from which criticism of Wundt's doctrine had already proceeded. For a third, the argument upon which the experiments rest is not demonstrably valid. It would, I think, be a very strange thing if three sets of stimuli should affect a number of observers by way of excitement-depression (or tension-relaxation) precisely as they do by way of pleasantness-unpleasantness,—but nobody can prove that such a state of affairs is, on the plural theory, impossible. Were I a champion of affective plurality, I should unhesitatingly urge these objections to the work, and I have no desire to slur them over because I am on the other side."

We believed it worth while, therefore, to add to the number of the experiments; and also to introduce into the conditions of experiment certain variations which might make for results more favorable to the tridimensional theory, provided that the theory is valid, or might at least cast additional light upon the nature of the feeling qualities. We have, for example, obtained two observers who were not only quite unpractised, but were also entirely unversed in theoretical psychology, so that the charge of laboratory bias can hardly be brought against them. Further, we have given all observers concrete daily experiences illustrative of the feeling-dimensions in question, thus trying to avoid the ambiguity of purely verbal orientation, and in its place to set up not only a constant but also a correct standard for all six of the Wundtian quality-groups. Furthermore, we have asked for judgments of pleasantness and unpleasantness only *after* the series in the other dimensions were completed, so that previous practice should give no suggestion towards an identification of pleasantness-unpleasantness with other feelings.

Method. We used the same harmonical and the same series of twenty-four clangs employed in the former experiments (C-c, c^1-c^2, c^3-c^4). The c did not sound especially loudly, as it did in Hayes' experiments. We took the usual precautions in arranging the order within the stimulus-pairs. Hayes' and Titchener's curves, and repetition of our own depression and strain series in reverse orders, show that the order (higher tone first or higher tone second) makes in general little difference to the course of the curves obtained. The series in the other dimensions were therefore given but once, and then

in haphazard order, care being taken merely that no tone should be oftener the first than the second of a pair. We gave the stimuli of a pair in the same time relations as did Hayes: 'Ready,' interval 2 seconds, tone 2 seconds, interval 2 seconds, second tone 2 seconds. Five seconds were allowed between successive pairs in all series except the strain series, where the observers declared the observation to be especially fatiguing, and a 10-second interval was at their request adopted. Rests of approximately 2 minutes were given after every 20 pairs, and the observers then jotted down such observations as occurred to them.

Before the experimental series of a given dimension, an hour—and before the work of a given hour, a period of several minutes—was spent on special training, intended to make apparent exactly what was meant by the term designating the quality to be judged. For *depression,* the observers were taken several times from the light and shut for a few moments in a dark room.[5] They were told not to think especially of anything, but to give themselves up to the impression which the darkness should make upon them. This total impression they were told to understand as depression, and they were asked to judge the tones in the light of this experience. We hoped that in this way a depression in Wundt's sense might be secured, and might serve as a constant standard of judgment throughout the experiment. For *excitement* the observers were similarly brought from a dark room into the light. As a preliminary to the *strain* experiments, the observers listened attentively to metronome clicks given at three-second intervals, and were told that the impression of the waiting period was to be understood as strain. For *relaxation* the metronome was again used, and the observers were told that the impression given them by the coming of the click and at once thereafter was the impression in question. For *pleasantness* the orientation was given by the taste of a quarter-teaspoonful of sugar syrup, and for *unpleasantness* by the taste of a quarter-teaspoonful of a 0.1% solution of sulphate of quinine. Subsequent test-experiments, in which two observers were given peppermint and certain perfumes to smell, tickled with a camel's hair brush on the lip, shown saturated colors in the dark, asked to perform mental multiplication, etc., and to tell what feelings were aroused in these cases, gave results in close accordance with Wundt's statements,[6]

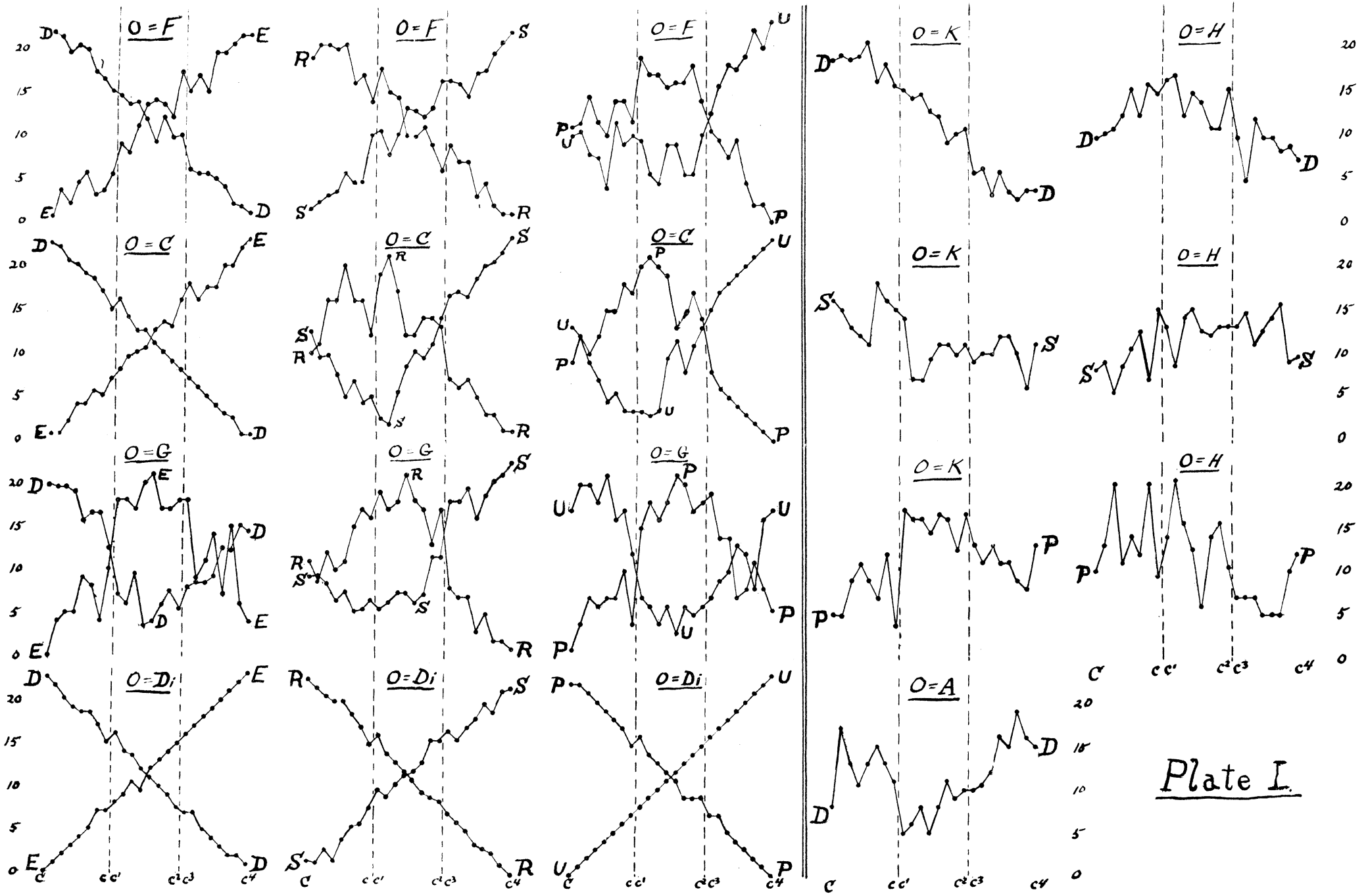
[5] See W. Wundt, *Grundzüge der physiol. Psych.,* ii, 1910, 295 ff.

[6] *Loc. cit.* The sole exceptions were that one observer called blue relaxing as well as depressing and pleasant, and red slightly straining as well as exciting and pleasant.

and indicated in a preliminary way that our illustrative experiences tended to give a correct notion of the nature of the six quality-groups. After the close of the complete experimental series for every quality-group, the observers were given a few repetitions of the regular and of the preliminary exercises, and were asked to characterize the impressions more completely, and especially to say what was common to both the preliminary experiences and the tonal experience, and to state (so far as possible) the basis of their judgment.

Observers. The one of us (R) served as experimenter throughout the experiment; the other (F) served as an observer, and is responsible for the formulation of results as expressed in this paper. The observers may be divided, on the basis of psychological knowledge and experience in psychological observation, into three groups. F, the writer, and Dr. J. N. Curtis (C), fellow in psychology, were highly practised observers; Mr. S. S. George (G) and Mr. F. L. Dimmick (Di), graduate students in psychology, had had considerably less practice. Miss E. Alspach (A), a senior, was forced to discontinue work after a single series on account of ill-health. Miss H. Hosmer (H) and Miss H. Kinnear (K) were freshmen with no psychological experience whatever. They had not even read a psychological text. The first four observers completed series in the order depression ↑, depression ↓, strain ↓, strain ↑, and then relaxation, excitement, pleasantness, unpleasantness, haphazard. The last two observers completed depression ↑, depression ↓, strain and pleasantness haphazard, and H at a later time also completed a second strain series.

Results. The curves for all observers are shown in Plate I. Single curves in the cases of D and S represent averages of ↑ and ↓ series. The use of the average is justified by the fact that under our conditions the ↑ and ↓ curves were quite similar; the average difference between corresponding ordinates of the curves for D ↑ and D ↓ was: for F, 1.3; for C, 0.3; for G, 2.7; for Di, 0.8; for H, 3.1; for K, 1.9. The figures for S ↑ and S ↓ were: for F, 2.1; for C, 1.5; for G, 1.5; for Di, 1.4; for H, 3.1. The greatest possible average difference (complete opposition) would evidently have been 11.5, and the least 0. If we express the general difference as a ratio of actual to possible difference, then F's D-curves have a general difference of 0.11; C's, of 0.03; G's, of 0.24; Di's, of 0.07; H's, of 0.27; K's, of 0.17; and the figures for the S-curves are F, 0.19; C, 0.13; G, 0.13; Di, 0.12; H, 0.27.


O = F
O = C
O = G
O = Di
O = F
O = C
O = G
O = Di
O = F
O = C
O = G
O = Di
O = K
O = K
O = K
O = A
O = H
O = H
O = H
C
c c'
c² c³
c⁴
Plate I.

The first fact to be noted, therefore, is the constancy of judgment of all our observers, where repetition of series involving a single quality-group is concerned. This constancy is greater than was obtained in a number of Hayes' series. The general difference of the P ↑ and P ↓ curves of Hayes' observer M, for example, even after considerable previous practice, is 0.96, and other large general differences may be found elsewhere in the work.

Secondly, from a glance at the curves of each pair of qualities, it is evident that under our conditions E and D, S and R, as well as P and U, are nearly exact opposites, a result which also did not appear uniformly in previous work.[7] We believe that for this outcome, as well as for the above mentioned constancy, our repeated orienting exercises are responsible.

Thirdly, we may point out that the curves which we have obtained belong in general to the types previously found. Inspection led us to believe that three typical pairs of curves could be made out. We may call them for convenience the X, the OX, and the XO pairs, exemplified respectively in the D-E pair of F, the S-R pair of G, and the P-U pair of G. For the sake of classifying doubtful cases, we further defined

[7] We may measure the degree of opposition as well as the similarity of our curves in terms of the general difference above referred to. Complete similarity is thus expressed by a general difference of 0 (=0/11½), neither similarity nor opposition by 0.5 (=5¼/11½), and complete opposition by 1.0 (=11½/11½). The expression of general difference, however, becomes more convenient if we transfer to a scale in which + 1.0 represents complete similarity, 0 neither similarity nor opposition, and —1.0 complete opposition. In general form, the steps in the method are then as follows: (1) sum up the individual differences of corresponding ordinates, taken without regard to sign; (2) divide this sum by the number of ordinates *times* the amount of the average ordinate; and (3) multiply this quotient by 2, and subtract the resulting product from 1.0. We have not as yet had opportunity to compare this method fully, either empirically or theoretically, with the standard methods of correlation. From the few cases in which we have made comparisons we get the impression that the Spearman method of rank differences and the foot-rule method especially, but probably the Pearson method also, in some cases at least give misleading results when used to measure similarity or opposition, as we here understand the significance of these terms. Even if this impression proves mistaken, our method finds a warrant for use in this particular case by merit of its simplicity. This question, and the question of the applicability of the method to other conditions than our own, we are forced to leave for future consideration. We may note further that we have measured by this method the oppositions and similarities stated by Titchener and Hayes in a number of possibly doubtful cases, and in every case the mathematical result verifies the judgments made by them on the basis of direct inspection.

these pairs in terms of the relative amounts of the sum of the ordinates within an octave.

If the order of these sums from left to right is great-medium-small (g-m-s), or small-medium-great (s-m-g), the curve belongs to the X type; if medium-great-small (m-g-s), or medium-small-great (m-s-g), to the OX type; if great-small-medium (g-s-m), or small-great-medium (s-g-m), to the XO type. The following Table shows the type-distribution of the 104 curves of our own and the previous experiments in terms of these six types:

		D	E	S	R	P	U	Total
X	g-m-s	12	3	0	9	10	0	34
	s-m-g	4	8	10	0	0	10	32
OX	m-g-s	2	2	0	2	4	0	10
	m-s-g	3	3	6	0	0	4	14
XO	g-s-m	4	1	1	0	0	1	7
	s-g-m	1	2	1	0	3	0	7
Total.	.....	24	19	18	11	17	15	104

This classification is, of course, to a certain extent arbitrary. By very definition it forces into a typical form, not only all our actual curves, but also all possible curves which we could have obtained. Its first justification (1) is that inspection led us to believe that a great majority of the curves fall into one of six such general forms. Only in a comparatively small number of cases was it necessary actually to compute the sums of the ordinates when determining their order. Still further justification for the classification, however, was sought. (2) After classifying the 104 curves according to type, we computed the average curve for each type, together with the mean variations of the 24 ordinates in each one of the six cases. Although a determination of the maximal variation possible without invalidation of type is undetermined (and, so far as our mathematical knowledge goes, undeterminable), the actual variations were so small that we consider them reliable evidence in favor of the existence of the six types. (3) Furthermore, small as were the mean variations, we were impressed by the fact that their amount was often determined, not so much by the large number of values closely approxi-

mating the averages, as by a few values which departed rather widely from it. We determined, therefore, to compute also the *median* deviation of the ordinates in every case; and thus, if these latter turned out to be less in amount than the mean deviations, to assure ourselves by this comparison that there was even greater evidence for the typical curve than the smallness of the mean variations indicated.

The results were astonishingly unanimous in confirming our impression. In the X pair, out of 48 (2x24) cases, the mean variation exceeds the median deviation in 45, and equals it in 2; for the same number of cases in the OX pair, the corresponding figures are 34+7, and for the XO pair, 39+4. In the total of 144, the mean variation exceeds in 118, equals in 12, and falls below in only 14 cases. Hence 0.82 (=118/144) may be taken as a rough representation of the tendency of our curves to cluster inside their mean variation from the typical curve.

The average mean variation of the g-m-s curve is 1.7, its average median deviation 1.2. Corresponding figures for its opposite (s-m-g) are 1.9 and 1.4. Less difference is apparent in the curves of the other pairs, though it still remains definite: m-s-g, 2.2 and 2.0; m-g-s, 2.2 and 1.9; g-s-m, 1.9 and 1.4; s-g-m, 2.4 and 2.1. This comparison, therefore, appears to us to show definitely a tendency of the individual curves to group closely about the average curve, thus justifying further our distinction of types.

Plate II shows the three pairs of average curves (the heavy lines). Above and below every ordinate of a curve its individual median deviations have been laid off, and these points have been connected by dotted lines. The space between the dotted curves thus formed, represents, probably more accurately than any other form of graphic illustration, the median range over which the variation from type takes place. The sum of the average median deviations for the six curves is 10.0. The maximal possible ordinate of our curves is 23.0. Hence $1 - \frac{1}{2} \times 10/23 = 0.78$ may serve to represent the definiteness with which our curves fall into six types.

We turn now to the introspective reports of our observers. As one reads them, their relevance to the corresponding curves (Plate I) becomes for the most part self-evident. We withhold interpretative comment here, remarking merely that many of our quotations are made from the introspections taken after a regular series was completed, because at that time general statements were practically required. It is to be remembered,

however, that such report was never given from memory alone, but was checked in every instance by actual experiment.

Depression and Excitement.

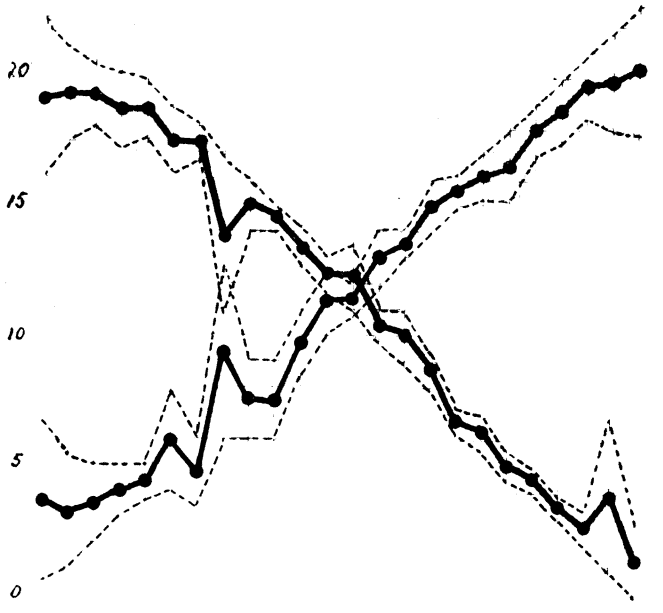
F. Darkness is "heavy, big, dull, inevitable." It "presses down on my chest and shoulders," and "seems to take the tonicity out of my muscles," "makes me feel quiet, subdued, passive, heavy," "throws me into a mood of 'don't care' or 'there's no use of doing anything.'" "The experience on the whole is rather pleasant." "Coming into the light gives me the feeling of 'lightness' and 'liveliness' or 'readiness,' the impression of heightened tonicity of the muscles." "My shoulders actually seem to rise and I feel lighter in weight." "This experience is also 'slightly pleasant.'" Judgments of depression and excitement with the tones are very easy. "The first stimulus merely puts me into a state, and the second 'lowers' or 'raises' and 'quiets' or 'arouses' me more or less than the first."

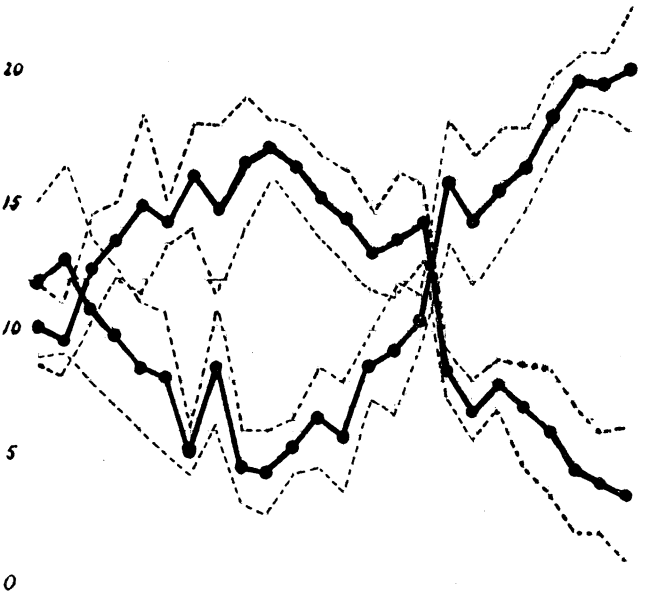
C. "Darkness makes me feel slow, subdued and serious." "It weighs me down like a weight on my shoulders and depresses me." The light made her feel "cheerful, springy, and light in weight, as if floating up instead of being pushed down." "Excited is too strong a word: it (light) is rather cheerful, quick, and to a slight degree pleasant." "The high tones aren't depressing at all." "The low tones sound almost the same way the dark room felt, i. e., they are serious, sober and subduing." "They are heavy and pressed on my chest, and made my breathing slower and deeper." (Afterwards remarks, however, that "all tones, even the low ones, are more cheerful than the darkness," and that "the low tones are pleasant and the darkness neither pleasant nor unpleasant.") Judgment, she maintains, is made on the basis of the change ('drop' or 'rise') of kinaesthesis in the chest.

G. Evidently takes depression and excitement in the sense of unpleasantly depressing and pleasantly exciting. "Darkness is sad, lonely and fearful, and takes control of me and makes me feel powerless." "The low tones are harsh and merciless, and shut close around you like the darkness, and they are sad and lonely." "I dislike them." "The middle tones give one a social feeling, and differ from the darkness in being pleasant and in not giving one a lonely feeling." "The high tones close in on one as the darkness does." "They seem lonely and distressing." "They are not unpleasant, but are like darkness sad and embarrassing."

Di. Found great difficulty in expressing the basis of his judgment in all six dimensions. He was at the time of the experiments also serving as an observer in experiments to determine the limens of pitch and volume of tones, and maintains that he could not entirely free himself from the 'sensory' attitude. "Cannot see that either low tones or darkness make more than a direct sensory impression on me." "They do not arouse what I should call feelings in me." "I cannot find any difference between the feeling before, during and after the tone, except in the direction of attention." "Would not ordinarily say that either the light or tones were in the least exciting." He "cannot see that the tones are like the darkness (or light) at all, except both are more or less big, diffuse, and roomy." This character is what he "has to understand depressing to mean."

K. "Darkness is heavy and solemn and makes me downhearted; is tiresome." "It is not quite boresome, but the *sameness* of it





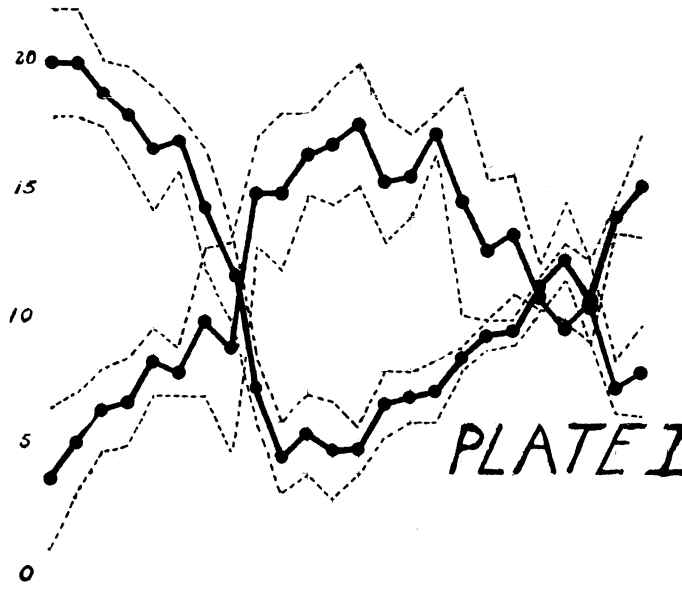


PLATE II

bores me." "The lower tones are mournful and deep and heavy." "They seem to fit in with the mood of the darkness." Medium tones "have a soothing effect and are a relief after hearing low tones." "They are more musical and pleasing." "Low tones have a tiring effect which medium tones do not have." "The high tones make me nervous." "They would seem out of place in the darkness, and generally have no depressing effect at all."

H. "Darkness seemed soft and heavy, and felt as if it belonged particularly to me," "rather inspiring." "It was not depressing particularly; not dreadful, but just serious. . . . In it I was happy in a quiet way." The low tones "seem far away and not so personal." "They are not at all inspiring and seem to run through and through me." "They seem thick and rough and blunt." "The medium tones seem nearer and more full of meaning." "They are more like the darkness than the lower notes because they are not so grasping." "The high notes are annoying and stick in my mind more unpleasantly."

A. "The judgments are hard to make because none of the tones press in upon me as the darkness did." "I seem to have to make my judgments on the basis of dislike."

Strain and Relaxation.

F. "Strain for me is attentive activity, tightness." "While waiting for a click I feel forced, held attentive." "The higher tones hold me attentive and strained." "This strain is 'thinner' than the strain of waiting, even though it may be more intense." "The strain seems localized primarily in my chest (holding breath or breathing tightly) and about my ears." "Relaxation is passivity, laxness, relief, freedom." "When the click comes, it lets me go, I sink down." "It is different from depression in that I am not *pressed* down, but 'drop' down of myself as far only as I want to go." "It is rather looseness, laxness, especially in the chest, and the fact of 'downness' doesn't matter."

C. "Strain is effort, tightness, tenseness, with irritation or impatience." "In waiting for a click there is a tension all over, especially in the muscles of breathing and around my eyes and ears." "The low tones are not accompanied naturally by strain." "In order to compare low or medium tones I have to institute a course of kinaesthesis, which resolves into the strain in my throat necessary to sing them; I have then to base my judgment either upon throat kinaesthesis or upon which tone I would prefer to have go on if one of them had to." "The strain of the high tones is much like the waiting strain in being irritating." "Aside from breathing, strain seems to be chiefly a matter of ear and throat kinaesthesis, the former in the case of high tones and the latter in the case of the low ones." "I can't get any general attitude except that of these strains and a sort of general irritation." "Relaxation judgments are much easier than strain, though not as easy as depression." "Relaxation is relief, restfulness, and a failure of any activity on my part." "It involves a general relaxation of the muscles which have been strained in expectation or by previous tones."

G. "Low tones are not straining at all; there is no impatience with them. You tend to exhale instead of inhaling or holding your breath, as you do in waiting for a click." "The [low] tones seem to press one down, and waiting and the high tones, to pull one up." "The muscles of themselves act independently of your activity in

listening to the tone." "The middle tones are pleasant and leave one normal." "I feel strain quickly if at all, but it takes some time for relaxation to come." "I seem to feel strain naturally, but relaxation is a secondary thing I have to tell myself to get. It is hard to keep the determination constant." "The [relaxation] judgment seems to me to be organic sensations and pleasantness."

Di. "Strain is expectancy, attentiveness, with strain sensations especially from respiration and in throat." "The tones simply came to me with strain or without." "The whole thing seemed very objective, the strain seemed to be the strain of the *tones,* rather than strain which I exerted." "Relaxation is simply lack of strain or less strain." "The more relaxing tone is the one which doesn't compel my attention." "There is nothing positive that I should call relaxation about the tones."

K. "The tones had the same effect as while I was waiting for the click. It was an impatient feeling, or as if something was still coming and I couldn't easily wait." "I am tense, and more or less impatient. There was a feeling of relief when it was over." "The middle tones didn't leave such a feeling of relief as the low or high ones did." "The more straining tone was the one which left the greater relief after it had gone."

H. "While waiting I feel tense, alert, nervous and annoyed." "The feeling was rather blank, but certainly straining." "The low tones do not seem to arouse much activity in my mind." "The middle tones produce the same feeling of strain [as the waiting] only less of it." "The high tones seem as if they might be straining, but some of them are too high for my mind to really sense them. They seem too small and indefinite." "I sometimes called the tone more straining if it left the greater feeling of relief."

Pleasantness and Unpleasantness.

F. Finds pleasantness "very hard to judge." "The sugar pleasantness is milder, smoother, calmer, evener, than the pleasantness of the tones, even the best of them." "It is hard to keep the affective set correct, or seems to be. The sweet made me tend to smile, and so do some of the tones more than others. . . . The pleasantness of the middle tones seems to me different from that of the low tones, though I can't say just how." Later: "Tremendously hard to judge between the moderately high and low tones. Both are slightly pleasant but the pleasantness seems different in the two cases: in the first, smaller and more definite; in the second, larger and more diffuse, somehow. In general, the pleasantness of the lower tones seems more like the pleasantness of the sweet." "The middle and lower tones are smooth, sweet and smilingly pleasant, like the sugar." "The pleasantness of the tones and sugar seems more in the tones and the sweet themselves than did depression, excitement or strain; the latter three seemed to be more my reaction." "The pleasantness seems to be more 'in my face,' and the depression, excitement and strain were more 'in my chest.' . . . I do not mean that I could localize absolutely definitely in either case." (In judging unpleasantness) "All tones except the very high ones seem pleasant, I have to translate them out of pleasantness-terms and say: 'This is less pleasant,' sometimes." "I think that even the high tones are not exactly unpleasant like the bitter, but rather unpleasant like sour. The low tones seem a little like bitter and sweet together, perhaps pleasant like chocolate." "Unpleasantness of the tones is more their

sourness than their bitterness. I can't make the high tones seem more than a little like bitter. They do tend to make me wrinkle up my nose and half sneer at them, somewhat as I tend to do at bitter and sour."

C. "Pleasantness [of sugar] seems like a warm glow over the upper part of my body." "The very first tone we had [*d*] felt just the same as the sugar." "It is quite hard judging between very high and very low ones. The low ones are diffuse like the pleasantness [of sugar] but they are also heavy and the pleasantness doesn't seem heavy at all. If I were going by the criterion of which I'd rather have go on, I'm sure I'd choose the low in preference to the high." Later: "Think I am set better than I was at first. I don't bother about all the stuff above. I simply don't like the high irritating tones, they seem to have a nasal twang that is unpleasant." "Pleasantness is more like relaxation than any of the other feelings we have had." "Unpleasantness is quite an easy judgment." "The bitter taste is quite unpleasant, so are some of the tones. Not sure whether it is the same unpleasantness. One big part of it seems to be kinaesthesis, only for quinine it is localized about my mouth and for the tones it is my whole body trying to get away." "The low tones are nice and cool."

G. "The sugar was not as pleasant as I thought it would be. What is more, I seemed to forget all about this pleasantness when I began to judge, and depended on my general attitude of pleasantness, rather than on that of the 'sugar pleasantness.'" "The sugar pleasantness was more or less too localized to be general pleasantness, which is more 'exciting' than that of sweet sugar." "The ['exciting'] pleasantness seems more to conform with that of the tones." "Unpleasantness is harder to judge than pleasantness. I sometimes feel at a loss and have to resort to all sorts of criteria other than unpleasantness, as straining, sad, shrinking, and all sorts of things." "None of the tones cause unpleasantness as we ordinarily understand that term." Later: "I am still having trouble with the judgment, as usually both of the tones are pleasant. The judgment comes to be merely the calling to mind of secondary criteria which the tones arouse, and calling these pleasant or unpleasant."

Di. "I am very dissatisfied with these judgments [of pleasantness]." "The pleasantness I am told to judge is not the same as I mean by pleasantness. Have to build up a criterion for the pleasantness of tones which is comparable to that of taste. The judgment seems to be not of pleasantness, but of which tone is sweeter." "The low tones have a heavy, almost sickly sweetness like honey. Big heavy tones sound like thick, rich sweets; I don't know why." Later: "Pretty sure that if I had been left to my natural pleasantness, I should have judged the tones by a different standard." "Unpleasantness gives the same difficulty as pleasantness." "Nothing in the tones like the bitter, but am trying to equate them." "I don't know what my basis is." "There is some tendency to pucker up my face [with high tones]."

K. "The medium tones are cheerful and pleasing like the sugar." "The low tones have a tiring effect. The high ones are so squeaky they make me a little nervous. They don't seem harmonious and aren't pleasant to hear."

H. "The low and medium tones are like the sugar because they are sweet and pleasant and soothe me. The sharp notes pierce me

and annoy me, and stick in my mind more unpleasantly than any. Some of them are so high they seem not to impress me at all."

After the regular experiments were completed, the four practised observers were asked: "What tastes are the following tones most like?" and were given the tones f^3, f^1, and F, each one several times over, with the harmonical. The f^3 was reported like "too strong a sweet" by G, and like sour by the other three observers. The f^1 was reported like sweet by F; like sweet and brown by C; like weak bitter by G; and like weak sweet by Di. The F was reported by F as like bitter and sweet; by C like sweet(?); by G. as bitter and flat; and by Di as 'sickish sweet.' Asked to arrange the feeling-series in order of the difficulty of judgment experienced, F arranged them (easiest first): Depression, Excitement, Strain, Relaxation, Unpleasantness and Pleasantness; C arranged them Depression, Relaxation, Unpleasantness, Excitement and Pleasantness, Strain; G's arrangement was Pleasantness, Strain, Relaxation, Depression, Excitement, Unpleasantness; Di called Strain the hardest, and the others all about equally difficult.

The summary and interpretation of the introspections must be prefaced by a comparison of our conditions with those in the experiments which it was our purpose to supplement. Titchener and Hayes in effect hypothesized the existence of the Wundtian feeling-dimensions. They oriented their observers generally only by single words, designating the qualities to be judged,—arguing that, with the stimuli used, the appropriate feelings should present themselves as bases of judgment, and express themselves in the production of typically different curves. We, on the other hand, have adopted another standpoint; we have taken for granted not Wundt's theory, but his observations. Working with this hypothesis, we have set our observers as definitely as possible within the circle of the experiences themselves, and have tried to ascertain whether or not the Wundtian theory follows. When the Wundtian feelings called for failed to present themselves in the previous experiments, a wide latitude of selection among bases of judgment still appeared possible in the Depression-Excitement and Strain-Relaxation dimensions. In our experiments, if we grant the correctness of the Wundtian observations, under the instruction and repeated suggestion to judge in terms of an empirical standard an observer has no such latitude of selection, but is definitely oriented for a given dimension, should have no difficulty in passing judgments on the basis of that

standard, and should give not only typically different curves for the various qualities, but also curves identical in type with those of other observers for the same quality.

But our hypothesis, too, receives no confirmation. To some observers, for some qualities, the tonal and the illustrative experience appeal apparently quite directly in a common aspect, and the judgment is accordingly easy. For other observers, and for other qualities, however, precisely the reverse is true: no common aspect can be directly found and the observer tends, contrary to instructions, to adopt either a more natural standard, or else some highly artificial non-affective standard of his own. Moreover, even when in the Depression-Excitement and Strain-Relaxation dimensions a common aspect is found, it is most frequently designated as pleasantness or unpleasantness, phrased in terms of secondary sensory concomitants, in terms of quasi-attributive character, or in both pleasantness-and-unpleasantness and sensory terms together. The illustrative experiences, that is to say, did not consistently make for ease of judgment. Often, especially in the pleasantness-unpleasantness dimension, exactly the contrary was the case. They did not produce uniformity of attitude among observers, nor bring into play the distinct bases of judgment to be expected. Unlike Titchener and Hayes, we find discriminable differences of attitude not only in the Excitement-Depression and Strain-Relaxation dimensions, but also in the dimension of Pleasantness-Unpleasantness. Why these latter qualities should, with different observers, give different curves, could scarcely have been asked by the earlier investigators, since their question was simply that of the number of typical affective curves for the single observer. In our case, however, this question is especially pertinent. A hint towards explanation is given, perhaps, by the fact that our observers speak of 'sickish,' 'sweet,' 'heavy,' 'warm,' 'cool,' 'big,' 'smooth,' 'localized,' and 'diffuse' pleasantnesses, and of 'bitter,' 'sour' unpleasantnesses, and that they also, after analyzing into sensory components the experiences to which these adjectives apply, speak of 'calming' and 'exciting' pleasantnesses, and of 'straining' and 'irritating' unpleasantnesses. The instruction to judge in the light of definite standards, which were at least partly sensory in character, seems to have disposed our observers to judge, not so much of affective values as of total sense-feeling values.

The question of the basis of judgment, however, cannot be dismissed by a mere reference to the possible diversity of sense-feeling. The fact which we were so particularly con-

cerned to bring out in the first part of our discussion of results, the fact that the curves of the observers in our own and in previous experiments fall into six types, arouses the suspicion that behind this uniformity must lie at least some community of attitude, some few specific sense-feelings, or some few other determining bases of judgment, masked as yet by the apparent heterogeneity of attitudes reported in the more or less incidental introspections. Despite repeated attempts to correlate the six typical curves with single factors or combinations of factors introspectively reported, we are for the present obliged to leave the matter quite unsettled.

We conclude our discussion of results by noting that the curves of our unpractised observers fall into the familiar types and show no distinguishing characteristic save a somewhat irregular course, and that the postponement of the pleasantness-and-unpleasantness series until the last appears to have made no difference to the curves obtained.

Conclusions

(1) We have approached the Wundtian theory of feeling from the standpoint of those determinate experiences which Wundt offers as typical of his three dimensions and six quality-groups. We find no evidence, either in the distribution of judgments or in the observers' introspective reports, for the correctness of the Wundtian theory.

(2) Our curves of distribution of judgments accord with those published by Titchener and Hayes. The whole set of 104 curves falls into three well-marked types of directly opposed courses. (Incidentally we have proposed a new method of measuring the likeness and unlikeness of such curves.)

(3) We have found evidence that the observers' basis of judgment is rather sense-feeling than affection pure and simple. We are not able, however, to correlate the three types of curve with three distinct sense-feelings or with three separable groups of such feelings. Future experiments must show whether this impossibility of correlation is inherent in the method of paired comparisons, as applied to the affective problem, or whether the method may be so refined, on the introspective side, as to furnish a solution of that problem.

We propose now to continue work with metronome-stimuli and systematic introspection. We shall thus be able to take account of the remainder of Titchener's and Hayes' curves, and to determine mathematically if metronome-curves fall into our three familiar types. We hope also, by making the introspective reports systematic rather than incidental, to ascertain the precise bases of the 'affective judgment.'